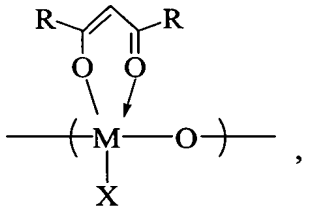
We Claim:

1. An anti-reflective coating composition comprising:

a solvent system; and

a polymer dispersed or dissolved in said solvent system, said polymer including recurring units having the formula

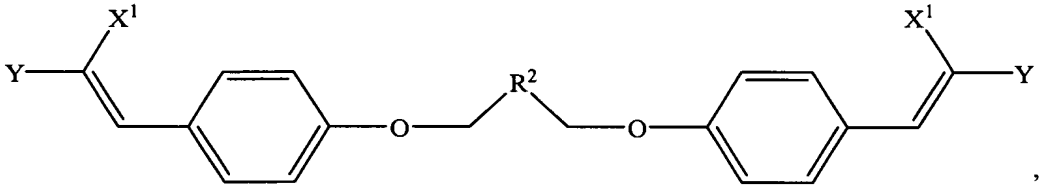


wherein:

M is a metal;

each R is individually selected from the group consisting of hydrogen, alkyls, aryls, alkoxys, and phenoxys; and

X is selected from the group consisting of compounds having the structure of I or II:



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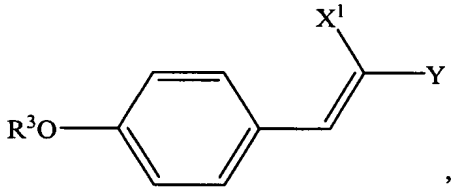


(II)

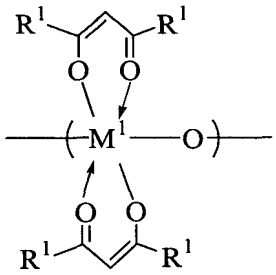
where:

each of X^1 and Y is individually selected from the group consisting of electron withdrawing groups;

R^2 is selected from the group consisting of alkyls and aryls; and

R^3 is selected from the group consisting of hydrogen and alkyls.

2. The composition of claim 1, said polymer further comprising recurring units having the formula



wherein each R^1 is individually selected from the group consisting of hydrogen, alkyls, aryls, alkoxys, and phenoxys, and M^1 is a metal.

3. The composition of claim 1, wherein M in each recurring unit is a metal individually selected from the group consisting of Ti, Zr, Si, and Al.

4. The composition of claim 1, wherein said composition further comprises a second polymer.

5. The composition of claim 4, wherein said second polymer is selected from the group consisting of epoxy novolac resins, acrylates, polymerized aminoplasts, glycourils, vinyl ethers, and mixtures thereof.

6. The composition of claim 4, wherein said second polymer has a weight average molecular weight of from about 1,000 to about 25,000.

7. The composition of claim 1, wherein one R is $-CH_3$ and the other R is $-OC_2H_5$.

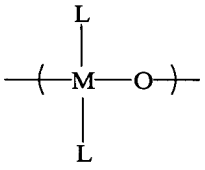
8. The composition of claim 1, wherein each of X and Y is individually selected from the group consisting of carbonyls, cyanics, nitriles, sulfones, and $-CO_2R^4$, where R^4 is an alkyl.

9. An anti-reflective coating composition comprising:

a solvent system; and

a polymer dispersed or dissolved in said solvent system, said polymer being formed by reacting a polymeric metal alkoxide, an organic compound, and a chromophore,

said polymeric metal alkoxide including recurring units having the formula



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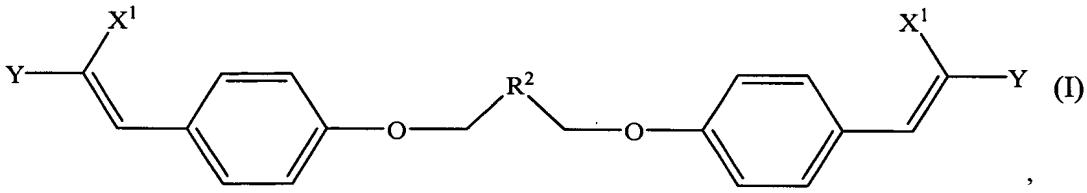
wherein M is a metal, and each L is individually selected from the group consisting of diketo and alkoxide ligands;

said organic compound comprising a functional group for coordinating with M of said polymeric metal alkoxide; and

said chromophore being selected from the group consisting of compounds having the structure of I or II:



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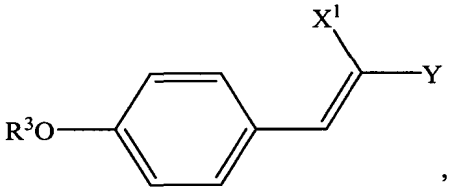


(II)

where:

each of X^1 and Y is individually selected from the group consisting of electron withdrawing groups;

R^2 is selected from the group consisting of alkyls and aryls; and

R^3 is selected from the group consisting of hydrogen and alkyls.

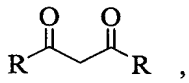
10. The composition of claim 9, wherein M in each recurring unit is a metal individually selected from the group consisting of Ti, Zr, Si, and Al.

11. The composition of claim 9, wherein said composition further comprises a second polymer.

12. The composition of claim 11, wherein said second polymer is selected from the group consisting of epoxy novolac resins, acrylates, polymerized aminoplasts, glycourals, vinyl ethers, and mixtures thereof.

13. The composition of claim 12, wherein said second polymer has a weight average molecular weight of from about 1,000 to about 25,000.

14. The composition of claim 9, wherein each L individually has the formula



wherein each R is individually selected from the group consisting of hydrogen, alkyls, aryls, alkoxys, and phenoxys.

15. The composition of claim 14, wherein at least one L is a moiety of ethyl acetoacetate.

16. The composition of claim 14, wherein one R is $-CH_3$ and the other R is $-OC_2H_5$.

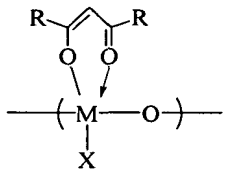
17. The composition of claim 9, wherein said functional group is selected from the group consisting of alcohol, phenol, and carbonyl groups.

18. The composition of claim 17, wherein said organic compound is selected from the group consisting of trimethylol ethoxylate, 4-hydroxybenzaldehyde, and 2-cyano-3-(4-hydroxyphenyl)-acrylic acid ethyl ester.

19. A method of using a composition in photolithographic processes, said method comprising the step of applying a quantity of a composition to a substrate to form a layer thereon, said composition comprising:

a solvent system; and

a polymer dispersed or dissolved in said solvent system, said polymer including recurring units having the formula



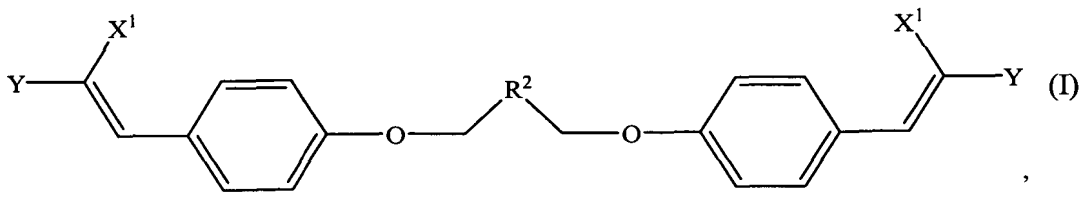
,

wherein:

M is a metal;

each R is individually selected from the group consisting of hydrogen, alkyls, aryls, alkoxys, and phenoxys; and

X is selected from the group consisting of compounds having the structure of I or II:



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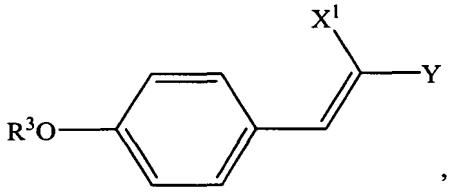


(II)

,

where:

each of X^1 and Y is individually selected from the group consisting of electron withdrawing groups;

R^2 is selected from the group consisting of alkyls and aryls; and

R^3 is selected from the group consisting of hydrogen and alkyls.

20. The method of claim 19, wherein said applying step comprises spin-coating said composition onto said substrate surface.

21. The method of claim 19, wherein said substrate has a hole formed therein, said hole being defined by a bottom wall and sidewalls, and said applying step comprises applying said composition to at least a portion of said bottom wall and sidewalls.

22. The method of claim 19, further including the step of baking said layer, after said applying step, at a temperature of from about 100-250°C to yield a cured layer.

23. The method of claim 22, further including the step of applying a photoresist to said baked layer.

24. The method of claim 23, furthering including the steps of:

exposing at least a portion of said photoresist to activating radiation; and

developing said exposed photoresist.

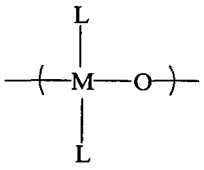
25. The method of claim 24, wherein said developing step results in the removal of said composition from areas adjacent said exposed photoresist.

26. A method of using a composition in photolithographic processes, said method comprising the step of applying a quantity of a composition to a substrate to form a layer thereon, said composition comprising:

a solvent system; and

a polymer dispersed or dissolved in said solvent system, said polymer being formed by reacting a polymeric metal alkoxide, an organic compound, and a chromophore,

said polymeric metal alkoxide including recurring units having the formula

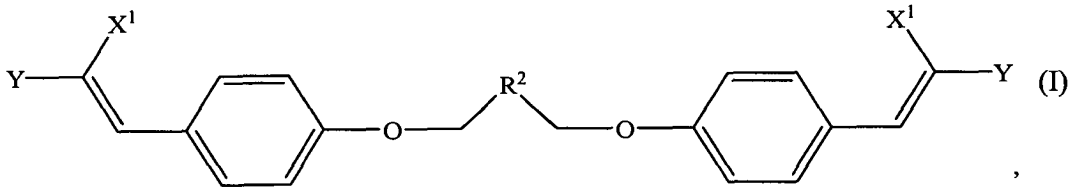


,

wherein M is a metal, and each L is individually selected from the group consisting of diketo and alkoxide ligands;

said organic compound comprising a functional group for coordinating with M of said polymeric metal alkoxide; and

said chromophore being selected from the group consisting of compounds having the structure of I or II:



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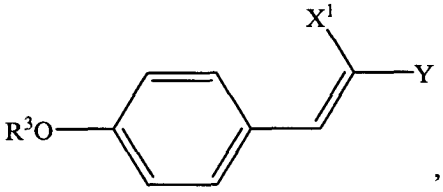

(II)

,

where:

each of X^1 and Y is individually selected from the group consisting of electron withdrawing groups;

R^2 is selected from the group consisting of alkyls and aryls; and

R^3 is selected from the group consisting of hydrogen and alkyls.

27. The method of claim 26, wherein said applying step comprises spin-coating said composition onto said substrate surface.

28. The method of claim 26, wherein said substrate has a hole formed therein, said hole being defined by a bottom wall and sidewalls, and said applying step comprises applying said composition to at least a portion of said bottom wall and sidewalls.

29. The method of claim 26, further including the step of baking said layer, after said applying step, at a temperature of from about 100-250°C to yield a cured layer.

30. The method of claim 29, further including the step of applying a photoresist to said baked layer.

31. The method of claim 30, furthering including the steps of:
exposing at least a portion of said photoresist to activating radiation; and
developing said exposed photoresist.

32. The method of claim 31, wherein said developing step results in the removal of said composition from areas adjacent said exposed photoresist.